

Health Consultation

**Cascade Pole and Lumber Company
Thurston County, Washington**

December 22, 2000

Prepared by
Washington State Department of Health
under a cooperative agreement with the
Agency for Toxic Substances and Disease Registry



Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. The health consultation allows DOH to respond quickly to a request from concerned residents for health information on hazardous substances. It provides advice on specific public health issues. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

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Glossary

Agency for Toxic Substances and Disease Registry

The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.

Cancer Risk Evaluation Guide (CREG)

The concentration of a chemical in air, water, or soil (or other environmental media), that is expected to cause no more than one additional cancer in a million persons exposed over a lifetime. The CREG is a comparison value used to select contaminants of potential health concern.

Cancer slope factor

A plausible upperbound estimate made by EPA of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used to estimate an upperbound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen.

Carcinogen

Any substance that can cause or contribute to the production of cancer.

Chronic

Occurring over a long period of time (more than 1 year).

Comparison Value

A concentration of a chemical used to select contaminants of concern which require further evaluation in the Health Assessment process. The terms comparison value and screening level are often used synonymously.

Contaminant

Any substance or material that enters a system (the environment, human body, food, etc.) where it is not normally found.

Dose

The amount of a substance to which a person is exposed; usually expressed as concentration of chemical per unit body weight.

Environmental Media Evaluation Guide (EMEG)

A concentration in air, soil, or water (or other environmental media), below which adverse non-cancer health effects are not expected to occur. Separate EMEGs can be derived to account for acute, intermediate, or chronic exposure durations.

Exposure

Contact with a chemical by ingesting, inhaling, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).

Exposure Pathway

An exposure pathway is the process by which an individual is exposed to contaminants that originate from a source of contamination. It consists of five elements: 1) Source of contamination, 2) Environmental Media/Transport, 3) Point of Exposure, 4) Route of Exposure, 5) Receptor Population.

Groundwater

Water found underground that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater often occurs in quantities where it can be used for drinking water, irrigation, and other purposes.

Lowest Observed Adverse Effect Level (LOAEL)

LOAELs have been classified into “less serious” or “serious” effects. In dose-response experiments, the lowest exposure level at which there are statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control.

MCL

Maximum Contaminant Level. A drinking water regulation established by the Safe Drinking Water Act. It is the maximum permissible concentration of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system. MCLs are enforceable standards.

MRL

ATSDR’s Minimal Risk Level. The dose of a substance below which adverse non cancer health effects are not expected to occur. MRLs are derived when reliable and sufficient data exist to identify the target organ(s) of effect or the most sensitive health effect(s) for a specific duration via a given route of exposure. MRLs can be derived for acute, intermediate, and chronic duration exposures by the inhalation and oral routes.

Media

Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.

Model Toxics Control Act (MTCA)

The hazardous waste cleanup law for Washington State.

Monitoring Wells

Wells developed to collect groundwater samples for the purpose of physical, chemical, or biological analysis to determine the amounts, types, and distribution of contaminants.

No Apparent Public Health Hazard

A conclusion category used when human exposure to contaminated media is occurring, or has occurred in the past, but the exposure is below a level of health hazard.

No Observed Adverse Effect Level (NOAEL)

The dose of a chemical at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects observed between the exposed population and its appropriate control. Effects may be observed at this dose, but were judged not to be “adverse”.

Oral Reference Dose (RfD)

RfDs are levels of chemical exposure, derived by the Environmental Protection Agency, below which non cancer health effects are not expected. An RfD is derived by dividing a LOAEL or NOAEL by “safety factors” to account for uncertainty and to provide added health protection.

RMEG

ATSDR’s Reference Dose Media Evaluation Guide. A concentration in air, soil, or water (or other environmental media), which is derived from EPA’s RfD, and below which adverse non- cancer health effects are not expected to occur. RMEGs account only for chronic exposure.

Risk

In risk assessment, the probability that something will cause injury, combined with the potential severity of that injury.

Volatile Organic Compound (VOC)

An organic (carbon-containing) compound that evaporates (volatilizes) easily at room temperature. Many commonly used cleaning solvents contain VOCs.

Background and Statement of Issues

The Thurston County Public Health and Social Services Department (TCHD) requested that the Washington State Department of Health (DOH) prepare a Health Consultation in response to concerns about potential health risks associated with the Cascade Pole Company site (site). TCHD's specific concerns pertain to the adequacy of site contaminant characterization as it relates to health risk, potential human health risks associated with the contamination, and the adequacy of the proposed Cleanup Action Plan (CAP) for public health significance. The Cascade Pole Sediments Operable Unit Risk Assessment, Remedial Investigation and Feasibility Study reports, Draft Cleanup Action Plan, and other supporting site documents listed in the Reference section at the end of this report were the primary documents used in evaluating the site and addressing TCHD's questions.

The 17-acre site is located on North Washington Street, at the north end of the Port of Olympia peninsula between the east and west bays of Budd Inlet (Figure 1). The site and adjacent parcels of land are owned by the Port of Olympia. The site is the location of a former wood-treatment facility that was operated since the early 1940s by a number of different companies, the most recent of which was Cascade Pole Company (CPC). Wood-treating operations, first using creosote, and later using both pentachlorophenol (PCP) and creosote, ceased in 1986. The wood treatment plant (and associated aboveground structures) was removed in mid-1990. In 1990, the Department of Ecology (Ecology), Port of Olympia, and CPC entered into a court-ordered agreement to investigate the extent of contamination and began remediating the site.

The site consists of two primary areas of investigation; an Uplands area, and a Sediments Operable Unit (OU). The Uplands area is the terrestrial (non-marine) portion of the site, and the Sediments OU is the marine portion of the site. Environmental investigations conducted at the site since the mid-1980's have documented the presence of contaminants in both of these areas, including soil, groundwater, marine sediments, marine water, seeps, and clam tissue.¹ Contaminants detected in the Sediments OU include dioxins, furans, carcinogenic polynuclear aromatic hydrocarbons (PAHs), pentachlorophenol (PCP), other semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and metals. Contaminants detected in the Uplands portion of the site include PAHs, PCP, dioxins, and furans in the soil, and PAHs, PCP, metals, and VOCs in the shallow aquifer. Many of these contaminants are associated with historical wood-treating activities at the site.¹

Budd Inlet background surface water and sediment samples (Figure 2), and Eld Inlet Reference Station clam samples (Figure 3) were also collected during the Remedial Investigation. The background locations were included in the site investigation to assess the levels of contaminants in areas of lower Budd Inlet believed not to be influenced by the site, but which could have been impacted by other sources. The reference location represented a relatively uncontaminated area in which clam tissue samples could be compared to clam tissue samples collected near the site. Eld Inlet also served as a reference area for a Benthic Abundance and Diversity assessment.¹ The assessment is described in the Remedial Investigation (RI) and Risk Assessment report for the

Sediments OU. Tables 1 through 3 contrasts the range of site contaminant levels, with background contaminant levels for carcinogenic PAHs and dioxins/furans in marine sediment, the marine water column, and clam tissue samples.

Results of Baseline Risk Assessment

A baseline Risk Assessment (RA) was conducted shortly after the RI to evaluate potential human health risks. Occupational, recreational, and tribal fish consumption exposure scenarios were evaluated. As no finfish chemical data were obtained during the RI, clam tissue sampling results were used in estimating potential health risk from finfish consumption. Given the exposure assumptions and chemical exposure point concentrations used, the RA concluded that the majority of risk in the Sediments OU was due to carcinogenic PAHs in sediments and clam tissue, chlorinated dibenzo-p-dioxins and dibenzofurans in sediment, water, and clam tissue; and PCP in sediments and seeps. The RA concluded that these risks were primarily the result of unacceptable increased cancer risks. Non-cancer health risks under the same exposure scenarios were estimated to be low or not expected at all.² As contaminated groundwater from the site is not used for domestic purposes, health risks from this pathway were not evaluated. Although no air monitoring was conducted during the RI, air modeling results indicated that estimated levels of VOCs released from sediments into the air were not an exposure of concern for the Sediments OU.²

Site Interim Actions

To minimize the further release of contaminants into the marine environment where the potential for human exposure could occur through contact with the sediments, water, fish, and shellfish, numerous interim actions were implemented at the site. In early 1992, CPC installed a groundwater and light non-aqueous phase liquid (LNAPL or floating product) extraction-and-treatment system (also known as a pump-and-treat system) across a portion of the site uplands. The system was designed to control offsite groundwater migration and to recover floating product. As of mid-2000, the system has treated approximately 51 million gallons of water and has recovered over 8,300 pounds of wood preserving product.^{3, 4, 5} The treated water is discharged to the Lacey, Olympia, Tumwater, Thurston County (LOTT) wastewater treatment system. In 1992 and 1993, a sheet pile cutoff wall and a dense non-aqueous phase liquid (DNAPL) recovery trench were installed. The 350 foot sheet pile wall was installed along the shoreline to prevent releases of wood treating product into Budd Inlet from the Uplands “hot spot” area. In 1996-97, a three-quarter mile long slurry wall was constructed around the primary source of contamination. The slurry wall and the sheet pile wall are tied together to minimize subsurface migration of contamination. In 1998, the Port paved nearly six acres of the site within the containment wall in an effort to reduce rainwater infiltration and the potential for further groundwater contamination.³

Multiple Benefits Action Area

In 1997, Ecology and the Port agreed on a plan to address the most significantly contaminated sediments. The Plan links the findings of the RI and the RA, and the Cleanup Action Plan, and is outlined in a 1997 Ecology Technical Briefing document.⁶ The Plan distinguishes between areas

proposed to be remediated (cleanup action levels) and areas proposed to be subjected to institutional controls, long-term monitoring, and natural attenuation and recovery until human health-based cleanup levels are achieved throughout the site Sediments OU for the primary contaminants of concern (carcinogenic PAHs and dioxin). The area and depth of contaminated sediments to be dredged were developed based on the extent of NAPL-impacted sediment combined with sediments that exceed sediment ecological and human health criteria. The area encompassed by the outward extent of these overlapping criteria is referred to as the site Multiple Benefits Action Area (Figure 4).

Recent and Planned Activities

Since 1997, a pilot dredging project, a hydrogeologic site investigation, and a spoils pile evaluation were conducted.^{7, 8, 9} These projects provided additional information necessary before final design and implementation of subsequent remedial actions could occur.

In July 2000, the Port began construction of a containment cell over the hot-spot area of the uplands portion of the site to house the dredged, contaminated sediments. The containment cell berm is being constructed with earth that is currently stockpiled onsite. Actual sediment dredging is planned for 2001. Options for treating the dredged sediments are being considered by the Port.^{3, 4, 5} After a period of settlement, a final low permeability cap would be placed on top of the entire cell to prevent potential human contact with the contaminated soil and sediment. Long-term monitoring of sediment, groundwater recovery and treatment, and free product recovery will be ongoing. The Port is currently evaluating steam injection as a means of more aggressively treating and removing chemicals in the soil and groundwater. Numerous No-Trespassing signs have been placed along the fence line that surrounds the uplands portion of the CPC site. Multi-lingual signs have been posted along the shoreline in the vicinity of the site informing the public of the potential health risks from the consumption of bottom fish and shellfish in the area.

Potential Receptor Populations

The Comprehensive Plan designation for the site vicinity is Urban Waterfront. The Shoreline Master Program for the Thurston Regions designates the site within an “Urban Environment.” Neither the Uplands portion of the site nor the Sediments OU currently sustains an on-site population. The site is fenced, although access to the Sediments OU is possible by walking along the beach from either side of the site. Currently, the only permanent resident population in the immediate area is a limited number of people who occupy boats as a residence in the East Bay Marina. A boat launch is located just north of the marina. As the adjacent Port property develops, the potential for public access could increase.

History of DOH Involvement

In the early 1990s, DOH provided technical comments on the draft Risk Assessment and Feasibility Study reports for the Sediments Operable Unit. In 1995, in response to health concerns expressed by the Squaxin Island Tribe, DOH conducted a survey of the Tribe’s fishing practices in order to estimate their exposure to Budd Inlet sediments and marine water.¹⁰ The report’s findings

also provided verification of the water and sediment exposure assumptions used in the site Risk Assessment. Most recently, DOH provided written comments on the CPC Site Sediments OU CAP.

TABLE 1

**CARCINOGENIC PAH, DIOXIN, FURAN, AND PENTACHLOROPHENOL CONCENTRATIONS IN SEDIMENTS
SITE AND BACKGROUND STATIONS^{1, 2}**

CONTAMINANT OF CONCERN	CONCENTRATION RANGE (SITE)	NUMBER EXCEEDING CLEANUP LEVEL	BACKGROUND RANGE (BUDD INLET)	UNITS
CPAH	170 - 300,000	29/117	490 - 1,200	PPB (dry wt.)
DIOXIN	5 - 1,290	13/28	1.2 - 1.8	PPT TEQ
FURAN	0.7 (U) - 2,100	16/117	0.6 - 0.9	PPT TOC
PCP	1.0 (U) - 240	0/117	2 - 39	PPB

CPAH = Carcinogenic Polynuclear Aromatic Hydrocarbons

PPB = Part per billion

PPT = Part per trillion

TEQ = Toxicity Equivalent Factor

PCP = Pentachlorophenol

**TABLE 2
CARCINOGENIC PAH, DIOXIN/FURAN, AND DIOXIN CONCENTRATIONS IN THE MARINE WATER COLUMN**

SITE AND BACKGROUND STATIONS

CONTAMINANT OF CONCERN	CONCENTRATION RANGE (SITE)	BACKGROUND RANGE (BUDD INLET)	UNITS
CPAH	(0.08 U - 0.08 U)	(0.08 U)	µg/l
DIOXIN/FURAN	0.0000179 - 0.0000556	0.0000059 - 0.0000122 (FURAN - 0.00000004)	µg/l TEQ
DIOXIN	0.00001116 - 0.00003405	0.00000394 - 0.00000842	µg/l TEQ

CPAH = Carcinogenic Polynuclear Aromatic Hydrocarbons

U = Undetected

µg/l = microgram per liter

TEQ = Toxicity Equivalent Factor

TABLE 3

**DIOXIN/FURAN AND CPAH CONCENTRATIONS IN CLAM TISSUE SAMPLES
SITE AND REFERENCE STATIONS**

CONTAMINANT OF CONCERN	CONCENTRATION RANGE (SITE)	REFERENCE STATION (ELD INLET)	UNITS
CPAH	670 (ND) - 1,500	170 (ND)	µg/kg
DIOXIN/FURAN	0.0026 - 0.0084	0.00071	µg/kg TEQ

CPAH = Carcinogenic Polynuclear Aromatic Hydrocarbons

ND = Not detected

µg/kg = microgram per kilogram

TEQ = Toxicity Equivalent Factor

**TABLE 4
FISH CONSUMPTION RATE ESTIMATES**

(GRAMS/DAY)

CASCADE POLE RISK ASSESSMENT (TRIBAL)	CASCADE POLE RISK ASSESSMENT (GENERAL POPULATION)	TOY TRIBAL STUDY¹¹ (ADULT MEDIAN RATE)	EPA EXPOSURE FACTORS HANDBOOK¹² GEN. POP. (MEAN)	EPA EXPOSURE FACTORS HANDBOOK NATIVE SUBSISTENCE ¹² (MEAN)
31	7.1	37	14.1 (MARINE FISH + SHELLFISH)	59
		(RANGE: 25 - 66)	20.1 (MARINE FISH + SHELLFISH + FRESHWATER FISH)	170 (95th Percentile)

TABLE 5
ESTIMATES OF BACKGROUND DIOXIN AND DIOXIN-LIKE COMPOUNDS ¹³

AND ESTIMATED DIOXIN EXPOSURES FOR ALL EXPOSURE PATHWAYS: CASCADE POLE SITE SEDIMENTS OU

RECENT EPA BACKGROUND ASSESSMENT				1992 CASCADE POLE RISK ASSESSMENT		
Exposure Route	Contact Rate	Dioxins and Furans		Exposure Route	Cascade Pole Risk Assessment Dioxin and Dibenzofuran Exposure Estimates Adult Future Onsite Recreational Scenario 95% upper CI	Percent of Exposure
		TEQ Conc.	Intake (pg/kg-day)			
Soil Ingestion	50 mg/day	12 pg/g	0.0085 = 0.55 pg/d	Sediment Ingestion @ 100 mg/day	0.047 pg/kg/day = 3 pg/day	0.06
Freshwater Fish	6 g/day	1.2 pg/g	0.13 = 8.5 pg/d	Sediment Dermal Contact	56 pg/kg/day = 3,640 pg/day	79
Marine Fish	12.5 g/day	0.36 pg/g	0.064 = 4.2 pg/d	Water Column Ingestion	0.00084 pg/kg/day = 0.05 pg/day	0.0011
Marine Shellfish	1.6 g/day	0.79 pg/g	0.018 = 1.2 pg/d	Surface Water Dermal Contact	1.7 pg/kg/day = 110 pg/day	2.4
Inhalation	13.3 m ³ /day	0.12 pg/m ³	0.023 = 1.5 pg/d	Ponded Surface Water Ingestion	0.0067 pg/kg/day = 0.44 pg/day	0.01
Milk	175 g/day	0.031 pg/g	0.078 = 5.1 pg/d	Ponded Water Dermal Contact	13 pg/kg/day = 845 pg/day	18.3
Dairy	55 g/day	0.12 pg/g	0.094 = 6.1 pg/d	Shellfish Consumption	0.3 pg/kg/day = 19.5 pg/day	0.4
Eggs	0.24 g/kg/day	0.032 pg/g	0.0077 = 0.5 pg/d	Fish Consumption (Tribal)	4.3 pg/kg/day = 280 pg/day	
Beef	0.67 g/kg/day	0.20 pg/g	0.13 = 8.5 pg/d			
Pork	0.22 g/kg/day	0.22 pg/g	0.048 = 3.1 pg/d			
Poultry	0.49 g/kg/day	0.11 pg/g	0.054 = 3.5 pg/d			
Vegetable Fat	17 g/day	0.056 pg/g	0.014 = 0.91 pg/d			
Water	1.4 L/day	0.0005 pg/L	0.000011 = 0.0007			
TOTAL			0.65 (~ 45 pg/day)		TOTAL = 4,618 pg/day	TOTAL = 100

TEQ = Toxicity Equivalence factor

CI = Confidence Interval

pg/kg/day = picogram of chemical per kilogram body weight per day

mg = milligram

pg/g = picogram/gram

g/kg/day = gram of chemical per kilogram body weight per day

pg/l = picogram of chemical per liter of water

kg = kilogram

Discussion

This Health Consultation was prepared in response to questions posed by the Thurston County Health Department about the Cascade Pole Company site. Thurston County Health Department's specific questions, and DOH's responses, are as follows:

Is the site sufficiently characterized as it relates to all areas of health risk?

Ecology is the lead regulatory agency responsible for overseeing investigation and cleanup activities at the CPC site, including assessing the adequacy of site characterization. Based upon review of the Remedial Investigation and Risk Assessment reports as well as other supporting site documents, overall, DOH believes that *at the time of the Remedial Investigation*, the site was reasonably well characterized as it relates to human health. DOH believes that the characterization was sufficient to enable a conservative estimation of potential human health risks under each of the exposure scenarios presented in the Risk Assessment. The exposure assumptions*, exposure point concentrations, and chemicals of concern used to derive exposure estimates and health risks for each pathway and receptor population were reasonable and appear more likely to have overestimated human health risks, rather than to underestimate risks.

Although overall, the site was reasonably well characterized, DOH is offering some recommendations to address current data gaps, some of which were included in our comments on the draft Cleanup Action Plan. By addressing these data gaps, DOH believes that a more current and complete picture of human health risk will be possible, *assuming that some exposure to the marine sediments, water, and/or fish is occurring*. DOH is offering these recommendations without regard to responsible parties and without the intention of hindering the proposed cleanup schedules. Further delays in removing the contaminated sediments only prolong the potential threat to human health.

1. Acquisition of more current sampling data, particularly for Budd Inlet background areas.

⇨ The CAP and RI concluded that Budd Inlet background water samples contained dioxin above human health criteria for the consumption of fish, although the data presented in the RI (Table C-4) suggest that dioxin may not, in fact, have been detected in these samples. For example, dioxin in background marine water column samples were assumed present at the analytical detection limit, even if the sample was qualified as "undetected"² If this is the case, estimated risks from dioxin exposure resulting from contact with Budd Inlet background marine water may have been overestimated. As some concern has been expressed about the potential health risks associated with exposures to background levels of contaminants in lower Budd Inlet, partly because the scope of the background sampling effort during the RI was limited and because the data are nearly ten years old, the

* Based on the results of a 1995 DOH survey of Squaxin Island tribal fisherpeople, the amount of contact with water/sediments appears to be comparable to exposure parameters evaluated in the Cascade Pole site Risk Assessment, particularly for the recreational scenario.

acquisition of additional background chemical data for sediments and marine water would be useful in assessing current risk. The number and location of background samples and the types of analysis needed are provided in the Recommendation section of this report.

2. Finfish chemical data.

⇔ Shellfish data were used in the RA to estimate health risks from exposure to finfish, under both the native and non-native exposure scenarios.² Although the RA indicated that, for various reasons, this scenario probably overestimated risk, it also indicated that other constituents of concern onsite may be present in fish tissue and were not detected in shellfish tissue samples. For this reason, and because the shellfish data are somewhat dated, finfish chemical data would be useful in assessing current risks. The usefulness of these data, however, should be assessed based on an actual survey of currently exposed populations. For example, are Vietnamese or other subpopulations not previously identified actually consuming fish from lower Budd Inlet, and if so, at what rate?

3. PCB data.

⇔ Although Polychlorinated Biphenyls (PCBs) were not detected in groundwater samples during either of the RI sampling phases, there was no discussion in the Risk Assessment about PCBs in the Sediments OU. If the Port believes there was no reason to suspect PCBs in sediments, marine water, or shellfish, supporting information to that effect should be provided.

4. Current status of contaminants in marine sediments.

⇔ Since implementation of the various source control measures (interim actions), as well as ongoing physical, chemical, and biological processes at the site, contaminant concentrations in the intertidal and subtidal areas within the Sediments OU would not be expected to be higher than during the RI, and may be lower. Conversely, sediment and contaminant transport beyond areas defined in the RI could have occurred since the RI. Data obtained either before sediment excavation, *or during performance monitoring activities at the time of sediment excavation*, should be evaluated to determine current sediment contaminant levels. Significant changes in contaminant levels (compared to the 1990-91 levels) could potentially impact the volume of material required to be dredged.

5. Status of chemical concentrations in the spoils piles.

⇔ Low to moderate levels of TPH, SVOCs, lead, and arsenic were measured in the spoils piles in 1997.⁹ Physical and chemical processes are likely to have reduced the concentrations of TPH and SVOCs in the piles since then. Since these piles will be handled during the construction of the containment cell, confirmation testing to determine the levels of these compounds is advisable. If such testing is not conducted, it should be assumed that the same levels exist, and appropriate site worker respiratory protection should be implemented.

Does the proposed Cleanup Action Plan eliminate or control all identified human health risk over time?

DOH believes the proposed Cleanup Action Plan presents a reasonable approach to reduce the potential health risks associated with exposure to the most significantly contaminated sediments within the Sediments OU. Further delays in removing the contaminated sediments only increases the chances for human contact and potential health risks.

Although DOH believes that the proposed CAP addresses the most significant sediment contamination, a number of questions remain that DOH believes can be addressed without impeding the current cleanup action schedule.

An integral part of the proposed CAP is the reliance on institutional controls (such as signs), long-term monitoring, continued source control measures, and use restrictions for sediments not proposed to be dredged outside the Multiple Benefits Action area.^{3, 4, 5} DOH's primary concern is the protection of public health. As long as the controls and restrictions described above are implemented and enforced, the proposals outlined in the CAP are reasonable. These controls are essential in order to *minimize exposure* to contaminated sediments exceeding standards for the protection of human health (as indicated by the outermost benefits line in the July 7, 1997 Technical Briefing document).

Only one of the seven alternatives evaluated in the Feasibility Study (FS) and CAP involves treatment of the contaminated sediments.¹⁴ DOH realizes that options for onsite or offsite treatment of dioxin-contaminated wastes are limited. To the extent practicable, DOH encourages the Port to evaluate new and innovative treatment technologies, particularly methods that address dioxin-containing soil/sediment. Cost and community acceptance considerations notwithstanding, treatment, rather than containment, would be the preferred alternative (WAC 173-340-360, sections 4, 5, and 8). This method provides greater human health protection in the event of a breach in the containment cell or cap, for example. Depending upon future land use in the immediate vicinity of the uplands area, such a breach, although unlikely, could potentially expose persons to the untreated sediments.

Do the proposed cleanup actions present human health risks?

DOH believes that the long-term benefits of removing, containing, and/or treating the most contaminated sediments as soon as practicable outweigh the potential short-term health risks that could be incurred during the proposed cleanup actions. Most or all of the short-term health risks, such as those that site workers might encounter, can be reduced or eliminated by simply adhering to the site-specific health and safety plan, particularly the provisions for dust suppression and respiratory protection. The most obvious risks include potential exposure of workers to VOCs and SVOCs released during sediment-dredging operations, exposure to elevated levels of contaminants present in the spoils piles during construction of the containment cell, and exposure to contaminants in soil in the uplands area during construction activities.

The proposed cleanup actions will likely result in short-term releases of dust, VOCs, and SVOCs into the air. DOH understands that an Air Emissions Control Plan will be developed to address these issues. The Plan will be reviewed by the Olympic Air Pollution Control Authority

(OAPCA).⁴ The CAP lists a number of regulations and site activities that address worker health and safety issues. For example, the Port is proposing to develop a site-specific health and safety plan (HASP), to conduct health and safety meetings, to employ dust control measures, to install fencing, and to implement exclusion zones to restrict access during cleanup activities. During construction and the operation and maintenance period of the cleanup action, protection monitoring will be conducted to confirm that human health are adequately protected. Construction activities are to be conducted in accordance with appropriate WISHA regulations.³

The proposed dredging operation itself, if not carefully conducted, could present additional risks. DOH encourages Ecology and the Port to evaluate available options to physically remove the contaminated sediments in a manner that would minimize the amount of contaminant resuspension. By doing so, potential recreational and worker exposures would be reduced.

Removal of additional contaminated sediments (beyond the areas currently proposed in the CAP) would result in lower quantities and concentrations of contaminated sediments in the Sediments OU, but could also create additional health risks. Examples include the possibility of further exposure to site workers, the release of additional VOCs and SVOCs into the air, further resuspension and contamination of areas outside the containment zone, and the increased potential for releases or spills should additional dredged material need to be transported offsite.

To strengthen (stabilize) the containment cell berm material, the Port has proposed the addition of cement kiln dust (CKD).^{3, 4, 5} CKD may also be applied to dredged sediments used to construct internal haul roads inside the containment cell. Depending on the chemical composition of the CKD, the potential exists for additional chemical exposures to workers handling the CKD. Of particular concern is the possible presence of dioxin. The Port and Ecology requested additional information from the CKD supplier regarding the content of the CKD, including the concentration of combined 2,3,7,8-TCDD congeners. The information was provided to Ecology and is summarized in the Recommendation section of the Health Consultation.

Child Health: Reproductive and Developmental Effects

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children deserve special emphasis with regard to exposures to environmental contaminants. Infants, young children, and the unborn may be at greater risk than adults from exposure to particular contaminants. Exposure during key periods of growth and development may lead to malformation of organs (teratogenesis), disruption of function, and even premature death. In certain instances,

maternal exposure, via the placenta, could adversely affect the fetus. After birth, children may receive greater exposures to environmental contaminants than adults. Children are often more likely to be exposed to contaminants from playing outdoors, ingesting food that has come into contact with hazardous substances, or breathing soil and dust. Pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults. For example, in the United States, children in the first six months of life drink seven times as much water per pound as the average adult. The implication for environmental health is that, by virtue of children's lower body weight, given the same exposures, they can receive significantly higher relative contaminant doses than adults.¹⁵

There is evidence that exposure to some of the chemicals that were detected at the CPC site could result in developmental and/or reproductive health effects. Most of this information is derived from observations of laboratory animals exposed to high doses of these chemicals over a prolonged duration. In estimating health risks, the CPC Risk Assessment included the evaluation of young children assumed to be exposed to site contaminants under a future recreational scenario. Reproductive and developmental health effects are also discussed in some detail in Appendix A of the CPC RA, in the attached chemical-specific fact sheets, and in the Toxicological Profiles listed in the Reference section at the end of this report.^{16, 17, 18, 19, 20}

The RA determined that the site poses unacceptable human health risks, including risks to infants and young children under chronic (long-term) exposure scenarios. As a result of these risks, various actions are being implemented at the site to reduce or eliminate potential exposures, including active remediation, source control, and institutional controls such as sign-posting and public notifications.

Conclusions

1. Past site activities, which resulted in the release of contaminants into the soil, groundwater, and marine environment at the Cascade Pole Company site, posed a public health hazard. Since groundwater at or downgradient of the site is not used for domestic purposes, a no apparent health hazard exists for this exposure pathway. *Long-term exposure* to elevated

levels of carcinogenic PAHs and dioxins identified in the Sediments OU could result in adverse health effects (primarily the increased chance of developing cancer). Although incidental, short-term exposures to sediments and water within or adjacent to the Sediments OU could occur (i.e., during boating/kayaking activities), frequent, long-term exposures to sediments and water in these areas does not appear to be occurring and therefore, pose a no apparent health hazard.

2. DOH believes that *at the time of the Remedial Investigation*, the site was reasonably well characterized. With few exceptions, the Risk Assessment was more likely to have overestimated health risk than to have underestimated health risk.
3. Although some questions and data gaps remain, DOH believes that they can be addressed without hindering the proposed cleanup actions and timeframes described in the CAP.
4. Although the Sediments OU RA report concluded that, under the conservative exposure scenarios evaluated, a public health risk would exist for exposed persons; because of the age and limited number of Budd Inlet *background* samples, there is considerably less certainty about current potential health risks for persons exposed to sediments in lower Budd Inlet background areas.
5. Ecology's proposal to contain the contaminated sediments on site is reasonable, as long as controls are in place to assure that human contact with the contained sediments does not occur. Controls should be developed to help minimize the possibility that any untreated sediments within the containment cell leave the site. Contingency plans should be in place to address such a release.
6. These conclusions are based upon DOH's review of the Cascade Pole Sediments Operable Unit Risk Assessment, Remedial Investigation and Feasibility Study, Draft Cleanup Action Plan, and other supporting site documents listed in the Reference section at the end of this report.

Recommendations and Public Health Action Plan

The following recommendations to protect public health are based upon the considerations and data gaps discussed above, without regard to the responsible parties. The recommendations are also based on DOH's review of the documents and reports listed in the following (Reference) section.

1. Because of the potential for short-term release and exposure to site-related contaminants during the construction and the operation and maintenance period of the cleanup action, DOH recommends monitoring to confirm that human health is adequately protected.
 - DOH supports the proposed Compliance Monitoring Program in general, and the Protection Monitoring in particular, both during and after excavation and dredging

operations, as described on page 14 of the draft CAP. Dust samplers and Organic Vapor Monitors are currently being used to monitor emissions from the site during containment cell construction activities.^{5, 21} If requested, DOH is available to evaluate the results of this or other air monitoring and will consult with OAPCA

2. Elevated levels of TPH, SVOCs, lead, and arsenic were measured in one or more samples during the 1997 spoils pile evaluation.⁹ Assuming levels of these compounds are still elevated, DOH recommends that site workers handling the spoils piles adhere to the provisions in the Site Health and Safety plan, particularly with regard to respiratory protection.

- ▶ DOH understands that appropriate health and safety measures will be followed during the construction of the containment cell and has informed Ecology that DOH is available to review the plan, if requested. In addition, representatives from the Department of Labor and Industries (L&I) and the Olympic Air Pollution Control Authority (OAPCA) have conducted site visits to observe site construction activities and to assure that appropriate health and safety precautions are being implemented. L&I is the lead regulatory agency for worker health and safety issues, and OAPCA is the lead regulatory agency that oversees air emissions at the site.

3. Because of the potential for dioxin exposure to site workers during the handling and application of the CKD, DOH recommends that Ecology or the Port acquire and evaluate this information from the CKD supplier. Should dioxin become an issue with regard to the CKD, this information should be incorporated into the site Health and Safety plan.

- ▶ Ecology has inquired with the CKD vendor about this concern. The vendor has indicated that it does not utilize hazardous waste as fuel in its cement-making operation and the dioxin and furan levels are 1.5 ppt (i.e., 4 to 5 times less than the Model Toxics Control Act (MTCA) Method B residential soil cleanup level.

4. Insofar as the proposed cleanup actions could impact public health, DOH encourages the Port to evaluate and implement the most appropriate treatment and control methods available at the time of the proposed sediment dredging operations in 2001.

- ▶ To minimize sediment resuspension, the Port and its contractors will utilize the latest technologies for control of resuspended sediment. The Pilot Dredging study conducted in 1998 evaluated some of the available control technologies. The study indicated that careful implementation of these control methods during large-scale sediment dredging is expected to minimize the amount of sediment resuspension that would occur without such controls.^{7, 22}

5. Finfish samples from lower Budd Inlet should be collected and tested for PAHs, dioxins/furans, PCBs, chlorophenols, and metals. The results should be used to assess current potential health risks. The usefulness of this data, however, should be assessed based on an actual survey of

currently exposed populations. For example, are Vietnamese or other subpopulations not previously identified actually consuming fish from lower Budd Inlet?

- ▶ DOH recently completed a health evaluation for mercury in Washington State, including Puget Sound fish, and is currently evaluating fish contaminant data from the PSAMP to assess human health risks from the consumption of Puget Sound fish contaminated with PCBs. A report summarizing the results of the PCB analysis is anticipated in 2001. After the PCB evaluation, a similar evaluation may be conducted by DOH for the pesticide DDT, and its decomposition products.²³ *These fish tissue evaluations are being evaluated as part of a Puget Sound wide investigation, however, not as a Cascade Pole Site-specific issue.*

6. Because of PCB's persistence in the environment, and because of its ability to bioaccumulate in fish tissue, subsequent sampling should include analysis of PCBs.

- ▶ PCBs were not detected in product, seep, or groundwater samples collected at the CPC site during the Supplemental Site Investigation in 1991.²⁴ As a result, there is no reason to believe they are a concern at this site. However, the DOH Office of Environmental Health Assessments is currently evaluating fish tissue data from the PSAMP to assess human health risks from the consumption of Puget Sound fish contaminated with PCBs. A report evaluating PCBs in Puget Sound fish is expected in 2001.

7. Signs in the vicinity of the site should be maintained and revised, as appropriate. Signs should also be placed in areas adjacent to the site where human contact is possible, such as the East Bay Marina and adjacent beach accesses. Signs should be clearly visible to the public. If subsequent background sampling is conducted and indicates a public health risk for other areas of lower Budd Inlet, signs should be included in those areas as well. All signs should reflect current health advisories, such as restrictions on fishing or shellfish harvesting, and should include appropriate agency names and phone numbers. The Port or other agency representatives should periodically inspect the signs.

- ▶ Thurston County Health Department (TCHD) has placed numerous health warning signs within and adjacent to the Cascade Pole Company site property as a result of site contamination. The Port was recently requested to place additional yellow (health warning) and red ("beach closed") signs at or adjacent to the East Bay public boat launch, moorage docks B&C, on the tidelands between KGY and Genoas restaurant, and on the pilings in the tidelands directly north of the site, facing the water. The additional signs were placed at these locations and were revised to reflect current contact phone numbers. As of the end of August 2000, a total of fifteen health warning and/or beach closure signs have been placed within or adjacent to the site (personal observation by DOH).

8. Because of ongoing concerns regarding the potential health risks associated with exposure to background levels of dioxin and other chemicals in lower Budd Inlet, DOH recommends the collection of at least three additional samples from Budd Inlet background areas for the following media: sediment, water column, bottom fish, and clams. The background locations should

represent areas not believed to be influenced by the site, and, ideally, from locations that are most likely to be accessed by the public. Sample analysis should include the following chemicals of concern: dioxins/furans, dibenzofurans, PAHs, PCBs, metals, and total organic carbon. Estimated health risks from exposure to background levels of dioxin in lower Budd Inlet, however, should be weighed against the estimated risks from other sources of dioxin (see Table 5). This information would help the public understand the *relative* risk posed by exposure to background levels of dioxin in Budd Inlet compared to dioxin exposure from dietary sources such as from beef and dairy products, which were found to be among the highest of all dioxin sources.¹³

- ▶ The DOH Office of Environmental Health Assessments is currently assessing PSAMP fish data collected from throughout Puget Sound. The PSAMP samples were collected over an approximately ten-year time period from various sites in Puget Sound. The samples were composite and individual samples from rockfish, English sole, coho salmon, and chinook salmon. All sites were not sampled each year. Analyses on PCB congeners has been completed for one year from English sole, rockfish, and salmon. The DOH Office of Environmental Health Assessments is in the process of evaluating this data. If background sampling is conducted, DOH is available to evaluate the results of the analysis to determine current health risks. To the extent possible, subsequent health evaluations should incorporate *site-specific* exposure scenarios, rather than standard default exposure assumptions.

9. The community should be kept apprised about significant site activities. When actual dredging begins, area residents should be notified and informed about the possible short-term impacts, such as dust, odor, and noise generation.

- ▶ Ecology periodically issues notices about site activities in its Site Register and has just completed a responsiveness summary to public comments on the CPC site Agreed Order, draft Cleanup Action Plan, and supporting documents. TCHD will be sending an advisory letter to East Bay residents to remind them that shellfish on their beaches are not safe to eat. In recent months, numerous articles have appeared in the Olympian newspaper.²⁵ DOH is also available to facilitate public outreach and health education efforts.

10. Dust and odor may become an issue during the construction of the containment cell and during sediment dredging. Dust suppression, air monitoring, and other appropriate controls should be applied to minimize these occurrences.

- ▶ The CAP includes a discussion of the controls that will be in place to address these issues. DOH is available to evaluate air/dust sampling plans, air dispersion models, and air sampling results for public health significance. Upon request, DOH is also available to review the Compliance Monitoring Plan outlined in the CAP, and the Health and Safety Plan (HASP) for the Site cleanup actions outlined in Attachment 9-1 of the draft CAP. Dust samplers have been placed both up and downgradient of the containment cell site to measure particulate levels during construction activities. Organic Vapor Monitors are also being used.^{5, 21} OAPCA staff has also reviewed the facility air emissions control plan.

11. After the CPC site Risk Assessment was completed in 1992, at least two surveys relevant to the Risk Assessment were conducted; one in 1996 acquired information about Squaxin and Tulalip Tribal fish consumption rates, and another conducted by DOH in 1996 surveyed Squaxin Island Tribal Fishing Practices in Budd Inlet to estimate contact with Budd Inlet water and sediments.^{10, 11} Subsequent southern Puget Sound Tribal health risk evaluations, if conducted, should incorporate exposure parameters included in these reports.

- ▶ A copy of this health consultation will be given to the ATSDR Office of Tribal Affairs.

12. DOH recommends that current advisories in effect for shellfish harvesting in lower Budd Inlet should continue and that shellfish not be consumed from any location in lower Budd Inlet due to bacteriological and chemical contamination.

- ▶ Signs warning people not to consume bottom fish, crabs, and clams have been posted in various locations adjacent to the Cascade Pole site. More recently, additional warning and beach closure signs were posted. DOH is working with Thurston County to determine the appropriate number, location, and wording of signs.

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Figure 1

Figure 2

Figure 3

Figure 4

CERTIFICATION

This Cascade Pole Company Site Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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Appendix

ToxFAQs